PVA Risk Guide

A Guide to Improving the Safety
of Passenger Vessel Operations by Addressing Risk

Table of Contents

INTRODUCTION:

Risk is a factor everyone encounters in maritime operations - decisions are made every day based upon it. Usually, your decisions are intuitive in nature and rooted in common sense. For example, the decision whether to get a dinner cruise vessel underway usually entails a risk assessment of the forecasted sea or river conditions. If significant seas might be encountered, spilled food or seasick passengers are very likely consequences. To manage these risks, the operator might choose to serve dinner dockside, cruise calm waters within a protected area, or cancel the event outright.

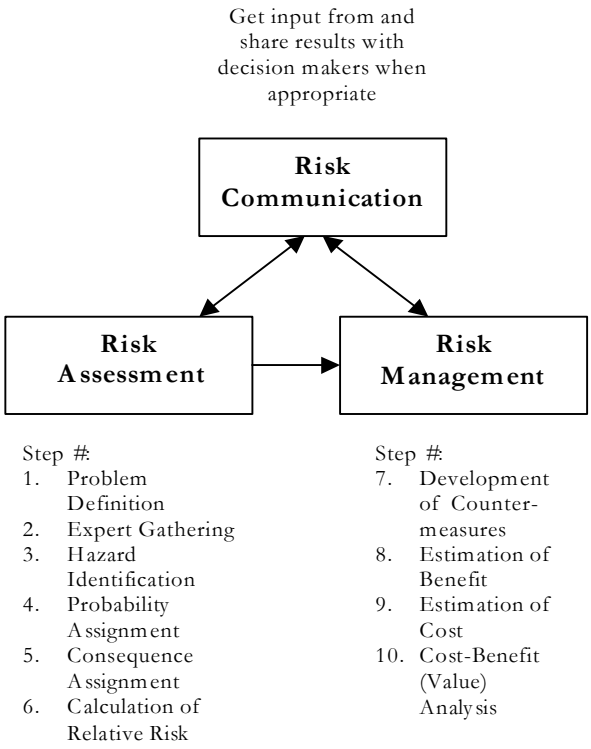
An everyday decision like the dinner cruise example does not need a guide. But suppose an operator wants to obtain an excursion permit from the Coast Guard in order to carry additional passengers for a one-time event. In such a case, a risk assessment that details anticipated hazards and looks at the likelihood and consequences of those hazards, and a risk management plan that specifies additional safety measures to address those risks, would clarify issues and help the Coast Guard in its consideration of that permit.

Being aware of your potential risks and knowing how to effectively control them is the goal of this guide. Developed by the U.S. Coast Guard and the Passenger Vessel Association (PVA), this guide provides you, passenger vessel owners and operators, with a step-by-step means of assessing risk within your operations and helps you develop ways to reduce or even eliminate those risks – in effect, making your operations safer.

This guide can be used to evaluate proposed operations, survey existing operations, or determine the effect of operational changes (e.g. increased traffic or low water). It is meant to address safety issues for a specific situation that you decide. The situation can be local, confined to a single vessel, or it can be even broader, involving an entire fleet or port area. This guide *is not* intended to provide the Coast Guard a means to regulate at the port level, however. This guide *is* intended to provide you a tool for identifying opportunities to reduce your risk-exposure by cost-effective means.

Risk can be handled by three activities – **risk assessment, risk management** and **risk communication**. This guide breaks these three activities into ten easy steps as shown below. Following these steps will help you identify potential problem areas in your operation, balance tradeoffs, and assist in decision making. This guide does not tell you which decisions to make, but shows you what to consider when making decisions so that you make the best decision possible.

Process for Handling Risk



The following terms are used throughout the guide:

Accident is an unintended event involving fatality, injury, ship loss or damage, other property loss or damage, or environmental damage.

Cause is a reason that an incident may occur.

Consequence is an outcome of an accident.

Countermeasure is a means of controlling a single element of risk.

Frequency is an actual or estimated number of potential occurrences per unit of time.

Hazard is an event (actual or perceived) that causes harm.

Incident is an event that may lead to an accident.

Risk is a combination of the frequency and the severity of the consequence of a specific hazard, event, or accident.

Risk assessment is a process for identifying hazards and assessing the risk (probability and consequence) posed by each.

Risk communication is a two-way process that (1) allows all stakeholders the opportunity to provide input into the process, and (2) provides a means of showing the value of decisions to others, which is particularly important when dealing with regulatory agencies or the public.

Risk management is a process for dealing with the assessed risks through the development of cost-effective countermeasures.

This icon points you toward the Risk Assessment Worksheet, Appendix 1, located in the back of this guide. The worksheet will help organize your work from each step.

Look for this icon for assessment advice. This guide is filled with expert tips, shortcuts, and lists to help you quickly and effectively perform each step of the assessment.

CASE STUDY: Two case studies are provided with this guide. ***They are both real life examples of how the process works.*** *One study is presented step-by-step in boxes, like this one, as the 10-step process is presented. The second study is provided as Appendix 2. Both cases demonstrate how the guide can be used to reduce risk. Use them for clues to help you proceed if you run into difficulties during your own risk assessment.*

ACKNOWLEDGEMENT:

Special thanks go out to the members of the of the Coast Guard/PVA Partnership Action Team natural working group who originally developed this guide, the organizations that have volunteered to give it a test run, and all those who have dedicated time to revising and improving it.

step 1

PROBLEM DEFINITION: ***What areas will this risk assessment look at?***

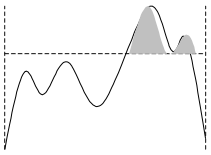
Before jumping into this risk assessment, determine what part(s) of your operation you can examine in the time you've set aside. To decide this, ask yourself a series of questions. Do you have the time to look at every aspect of your operation? *Probably not*. Do you only want to look at certain times, such as when passengers are onboard? You may just have a specific problem you want to deal with like a faulty gangway ramp. All of these problem areas can be dealt with by using this guide.

Define the scope of your assessment before starting any work to help focus your efforts. The scope of your assessment and the amount of time needed largely depends upon the operation you've decided to examine. Periodically pick up this guide and reassess various parts of your operation to continuously improve safety.

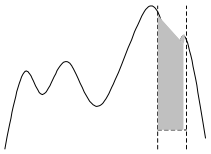
tip

Think of your entire operation and the range of all potential problems as a mountain range.

If you want to look at the entire scope of your operation, you will only be able to focus on the highest of peaks.



However, if you choose a specific aspect of your operation (for example, passenger loading) you can examine it in greater depth and detail.



CASE STUDY: This showcases the efforts of North Ferry Company, which operates four vehicle ferries on a one-mile route over inland waters between Long Island and Shelter Island (NY). In 1997, more than two million passengers were carried aboard their ferries. (Each of these double-ended ferries can carry up to 13 automobiles and almost 100 passengers.) North Ferry has long been committed to providing safe, efficient, and cost-effective transportation. As an active member of PVA, North Ferry volunteered to perform a trial run of the Risk Guide.

North Ferry devoted an entire day to this trial run and focused directly on their operations from loading to unloading.

In the spaces provided on the attached PVA Risk Assessment Worksheet (Appendix 1), fill in the company name, the vessel(s) name, and the operational phase.

EXPERT GATHERING: ***Who should be involved in this risk assessment?***

After you've defined the scope of your assessment, determine who needs to be involved. This is a key part of the process – the right mix of people and experience is necessary to get the most out of your assessment. Different experts will turn up different risks and come up with different results.

Does your assessment involve the entire port? If so, it might be good to get the Coast Guard, the local port authority, or harbor master involved. Does your assessment involve only your vessel? If so, only your vessel crew and perhaps the Coast Guard need to get involved. If you are concerned about deep-draft traffic, you may want to include one of those operators or a local pilot.

As you can see, the participation will vary from assessment to assessment. For best results, it is recommended that you have between three and seven participants. You may also choose to involve participants for only a particular portion of the process. For example, consider involving other operators to answer the question, "What can go wrong?" They will have a perspective of your operation that is different from yours.

The following list gives an idea of some of the participants you may want to include:

- Environmental organizations
- Ferry operators
- Industry associations
- Local Coast Guard (e.g. ATON, MSO, SAR, VTS)
- Local port authorities
- Local pilots

- Local towing companies
- Other federal government agencies (e.g. Army Corp, EPA, Navy, OSHA)
- Other vessel operators
- Shoreside management
- State government agencies (e.g. Environmental protection)

If recreational boating is a significant factor in your operating area, the following may also be of assistance:

- Coast Guard Auxiliary
- Harbor masters
- Other safety organizations (EMS personnel, fire chiefs, fire marshals, local police)
- U.S. Power Squadron
- Waterway patrol officers
- Yacht/sailing clubs

CASE STUDY: Six people gathered to conduct the trial risk assessment. ***The group consisted of North Ferry s president, its Operations manager, two of its senior captains, a senior engineer, and one local Coast Guard marine inspector.*** *There was a good cross-section of operators, shoreside people, and regulators.*

In the spaces provided on the attached PVA Risk Assessment Worksheet, fill in participant names and functions/titles/organizations.

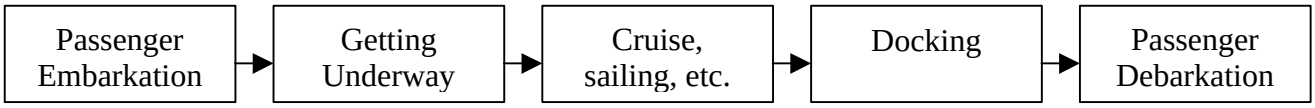
step 3

HAZARD IDENTIFICATION: ***What can go wrong?***

Once you've decided the scope of this exercise (step #1) and assembled a group of experts (step #2), you can get into the more individualized aspect of the assessment. Develop a list of "What can go wrong?" In other words, what are the potential hazards? Collisions in restricted passages? Powered groundings on exposed reefs? Loss of passengers or crew overboard? Car fires on deck? When compiling this list, keep in mind the scope of the assessment. If you're only concerned with what happens while underway, don't consider a fire resulting from welding repairs alongside. (You may want to consider that at another time.) Also, it is very important that your list of "What can go wrong?" contains only hazards that directly involve a negative impact or consequence. For example, a loss of steering (in and of itself) is not a hazard; however, a hard grounding due to a loss of steering is considered a hazard. Try to be specific in your listing. It is difficult to assign frequency and impact to broad hazards (e.g. all groundings), as you'll soon find out in the steps following.

tip

One way to identify hazards is to develop a flow chart of the operation(s) you ve decided to assess. To develop the flow chart, list or describe each overall function or activity being performed (within your specific area of concern). These functions or activities will be sequential in nature and usually follow a timeline. This flow chart will give you a broad picture of the operation. Suppose you decide to examine only the portion of your operation when passengers are actually aboard. The following will result.



From the moment that passengers step aboard to when they last depart, you will examine each activity of that phase of the operation and develop potential hazards.

tip

Here is a list that gives an idea of some of the potential hazards you may want to consider. Consider perceived and potential hazards as well; do not look at just those that have historically occurred. Depending upon the problem you have defined, additional hazards will need to be added.

Personnel Casualties

- Crew injury involving machinery
- Crew injury while alongside or getting underway (e.g. line handling injuries, dock-jumping injuries, falling into water)
- Man overboard
- Medical emergency
- Passenger injury during embarkation or debarkation
- Passenger violence
- Slips, trips, and falls while underway

Material Casualties - Ship

- Allision due to lack of situational awareness
- Collision due to inattention
- Collision due to mechanical failure
- Collision due to other ship s fault
- Drift grounding caused by mechanical failure
- Engine room/machinery space fire
- Explosion on board
- Galley fire

- Hard docking resulting in damage
- Powered grounding
- Other shipboard fire

Material Casualties - Shore

- Explosion in terminal
- Fire in terminal
- Structural damage to terminal due to ship allision

Environmental Impacts

- Bottom scouring
- Exhaust emissions
- Hazardous material discharge
- Noise
- Oil pollution due to vessel accident
- Pollution due to oil discharge
- Sewage discharge
- Wake damage

CASE STUDY: Once the group understood the scope of the assessment (step #1), ***they began identifying what could go wrong*** *with navigation and mechanical failures as well as personnel mistakes. They divided their operations into three categories: underway, docked, and out of service. Working through these three categories of operation as a tool, they prepared a list of things that could go wrong. The list contained things such as an engine room fire, vehicle fire on deck, collision with another vessel, hard docking, flooding, grounding, loss of propulsion, minor pollution from vehicles on deck, shifting vehicles, and crew mishaps.*

In the spaces provided on the PVA Risk Assessment Worksheet, describe the hazards that could occur. If you need more space, use another sheet of paper.

step 4

PROBABILITY ASSIGNMENT: ***How often might it happen?***

For each potential hazard identified in the previous step ("What can go wrong?"), rate the likelihood or frequency of that hazard occurring. How often might it happen? Note that this is an estimate of how often the potential hazard could *possibly* occur, not how often the situation presents itself. Just because you encounter a certain situation every day does not mean you will experience its associated potential hazard every day.

Decide how frequently each of the events listed in Step #3 *could* happen. Discuss each event and rate them using the following scale.

Assign a rating of:	if the frequency is:
1	REMOTE = Might occur once in a lifetime.
2	OCCASSIONAL = Might occur every five years.
3	LIKELY = Might occur every season or year.
4	PROBABLE = Might occur monthly.
5	FREQUENT = Might occur daily or weekly.

When rating a group of potential hazards, it is extremely useful to compare them to ensure consistency. You may have refined your ideas about the rating scheme in the middle of this step, and the ratings may need adjustment. These ratings will be used in Step #6 to help determine which hazards have the highest risks.

CASE STUDY: Once they identified what could go wrong, the North Ferry group determined how often each hazard, on average, might take place. ***They discussed each hazard individually, talked about its frequency, and came up with a consensus of how each hazard should be rated****. For example, the group felt that a vehicle fire, a relatively infrequent event, might happen once in five years (frequency = 2), while a hard docking, a relatively common occurrence, might occur once a week (frequency = 5).*

In the spaces provided on the PVA Risk Assessment Worksheet, fill in the frequency rating for each hazard.

step 5

CONSEQUENCE ASSIGNMENT: ***What would the impact be?***

For each potential hazard identified in step #3 ("What can go wrong?"), rate the impact of that hazard occurring. Discuss each hazard and rate its impact using the following scale.

Assign a rating of:	if the impact could be:
1	NEGLIGIBLE = Injury not requiring first aid, no cosmetic vessel damage, no environmental impact, no missed voyages.
2	MINOR = Injury requiring first aid, cosmetic vessel damage, no environmental impact, no missed voyages.
3	SIGNIFICANT = Injury requiring more than first aid, vessel damage, some environmental damage, a few missed voyages or financial loss.
4	CRITICAL = Severe injury, major vessel damage, major environmental impact, missed voyages (up to and including the entire season).
5	CATASTROPHIC = Loss of life, loss of vessel, extreme environmental impact.

You may develop your own scale for rating frequency depending on the nature of your operation and the scope of your assessment. As in the previous step, you'll want to compare the ratings for consistency and to make sure they make sense. These ratings will be used in step #6 to help determine which hazards have the highest risks.

CASE STUDY: After rating how often each hazard might happen, the North Ferry group looked at what the impact would be if the hazard did happen. Again, ***they discussed each hazard based on their own experiences and came to an overall conclusion of how each hazard should be rated****. For example, they felt that a vehicle fire would have critical impact (impact = 4), while a hard docking would have a serious impact (impact =3).*

In the spaces provided on the PVA Risk Assessment Worksheet, fill in the impact rating for each hazard.

step 6

CALCULATION OF RELATIVE RISK: ***Where should you focus your efforts?***

Now that each hazard's frequency (step #4) and impact (step #5) are rated, you can combine the two to determine the relative risk or priority. This will show you what hazards are the greatest risks to your business. This is done by adding* the frequency rating (1 to 5) to the impact rating (1 to 5) to get a relative risk score (2 to 10). A relative risk score of 10 indicates a catastrophic event that may happen all the time; a score of 2 indicates an inconsequential event that likely won't happen at all. The highest scoring hazards (i.e. highest relative risk scores) should be addressed *first*. If there is a tie, the group should discuss and prioritize those hazards in more depth to break the tie. Once all hazards have been scored and prioritized, choose the highest scoring hazards to focus your efforts on.

tip

The table below, which is similar to the worksheet, is useful in identifying where you should focus your efforts.

Event	Frequency Rating	+	Impact Rating	=	Relative Risk Score
XYZ	1		4		5 (=1+4)
ABC	3		3		6 (=3+3)

It's close, but ABC should be addressed first because it has a higher relative risk score based on the expert judgement previously given.

CASE STUDY: ***The North Ferry Group next combined the frequency and impact to get an idea of relative risk.*** *To do this, they simply added the frequency rating (step #4) and the impact rating (step #5). The table below shows a portion of the results of their assessment.*

Event	Frequency Rating	+	Impact Rating	Relative Risk Score
Engine Room Fire	1	+	5	6
Vehicle Fire on Deck	2	+	4	6
Collision with Another Vessel	1	+	3	4

*In additional sense, risk = probability x consequence. However, because the scales used in this guide are ordinal and close to logarithmic, addition will give a more accurate picture of risk.

In the spaces provided on the PVA Risk Assessment Worksheet, fill in the relative risk score by adding the ratings from Step #4 and Step #5. Transfer the event descriptions with the highest scores to the space called Focus Hazards. There is room for three focus hazards on the sheet. Beware - this may be more than you can tackle in one sitting.

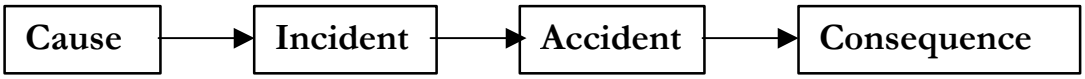
step 7

DEVELOPMENT OF COUNTERMEASURES: ***What can be done to address these risks?***

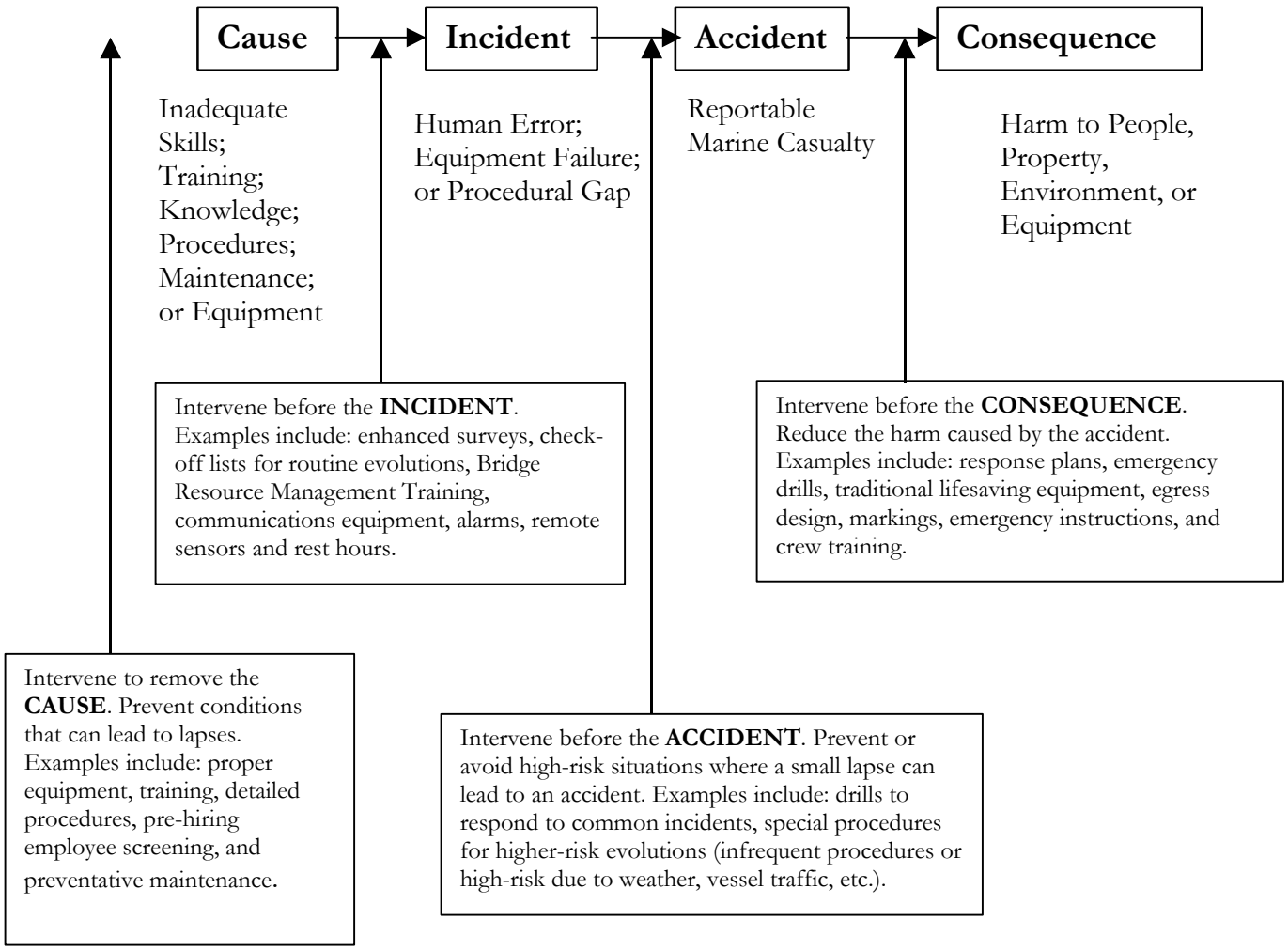
Up to this point, you have focused on looking at how to frame the problem and identifying and rating potential hazards to come to the decision of what hazards should be addressed first. Now, you'll look at what can be done to address the potential hazards with the highest relative risk -- those identified in step #6. What can be done to address these risks? In this step, you'll come up with a list of countermeasures that can be used to avoid or lessen the impact of the potential hazards. These countermeasures will help to make your operation safer. For each hazard, look for countermeasures based on people, procedure, or equipment solutions. The best way to look for these is by breaking the potential hazard down into a chain of events. This is often referred to as the causal chain. This chain of events captures what may have led up to a casualty or hazard occurrence. The reason for developing these countermeasures is to break the causal chain so that it can't be completed.

tip

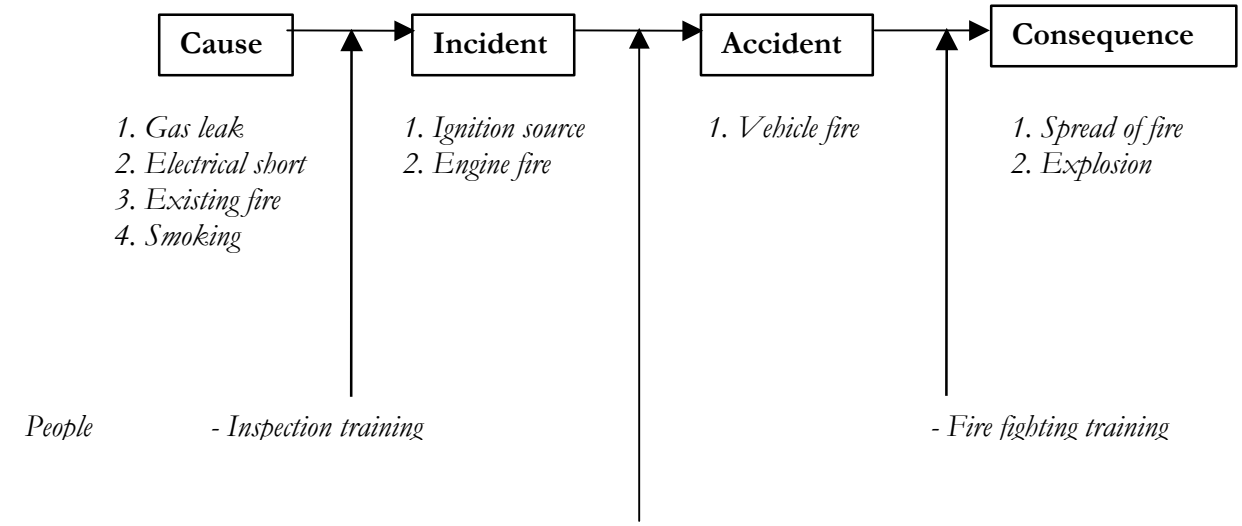
This is the basic causal chain.



Use the following diagram as a guide for where to apply different countermeasures. The examples include only a portion of potential countermeasures.



CASE STUDY: Due to time limitations, the North Ferry Group selected a single potential hazard to examine in depth. They felt it would be difficult to adequately examine hard docking and loss of propulsion, so they chose to examine vehicle fire on deck. ***By looking at the causal chain, they came up with the following interventions.***



People	*- Inspection training*		*- Fire fighting training*
Procedure	*- Inspect vehicles before loading* *- Enforce no-smoking* *- Clean flammable spills* *- Enforce engines off*	*- Observe vehicles on deck* *- Extinguish matches, cigarettes* *- Extinguish engine fires and other fires*	*- Fire fighting* *- Move vehicles away from fire* *- Notify fire department, Coast Guard, other boats*
Equipment	*- Public address system*	*- Fire extinguishers*	*- Fire extinguishers* *- Fire pumps and hoses*

In the spaces provided on the PVA Risk Assessment Worksheet, fill in potential countermeasures for each focus hazard.

Now that you've developed a list of potential countermeasures for addressing each specific hazard, the next three steps will guide you in picking the best countermeasures.

step 8

ESTIMATION OF BENEFIT: ***How effective will these potential solutions be?***

Will these countermeasures reduce the potential risk? A countermeasure is considered effective if it reduces the relative risk score (step #6). Use the following table to estimate effectiveness.

Estimate of Effectiveness	Description
1	LOW = No reduction in the relative risk score.
2	MEDIUM = Reduction of the relative risk score by one or two points.
3	HIGH = Reduction of relative risk score in excess of two points.

For example, suppose an operator added an extra staff person to assist passengers during embarkation and debarkation. This could result in the impact rating dropping from a minor impact to an insignificant one (see step #5). This countermeasure would rate medium effectiveness. Just as you did in the frequency and impact ratings, compare your results for consistency's sake.

*CASE STUDY: Steps 8, 9, & 10 were developed as a result of the comments from North Ferry's trial run of the Risk Guide. Therefore, the North Ferry group did not formally complete these steps. Instead**, they looked at each of the measures and attempted to estimate cost and effectiveness**. This information was used in selecting which measures to use. They felt that some of the least expensive measures proposed, such as inspecting vehicles for gas leaks or small existing fires before loading, might prove to be the most effective because they stopped the causal chain of events at the earliest possible stage.*

In the spaces provided on the PVA Risk Assessment Worksheet, fill in the estimate of effectiveness for each of the countermeasures that you recorded in step #7.

step 9

ESTIMATION OF COST: ***How costly will these potential solutions be?***

You will next need to assess the cost of putting those measures into your operation. How costly will this potential solution be? You are not expected to come up with hard numbers, but only a rough estimate. You will need to estimate the cost of each countermeasure, whether it's rearranging work schedules or procedures, installing new equipment, or providing additional training for the crew. Use the following rating scale as a guide.

Cost Estimate	Description
1	LOW = Low or no cost.
2	MEDIUM = Approximately equal to the revenue received on a good day.
3	HIGH = Greater than the revenue received during a week or more of operation.

Just as you did above, you will want to compare your results for consistency's sake. Is one medium cost measure like the next medium cost measure or is it more expensive and therefore considered high cost?

CASE STUDY: As mentioned before, the North Ferry group did not complete this step. ***The North Ferry group found that it is not always necessary to adopt expensive solutions to reduce risk.*** *The North Ferry group found that the costs of extending a shoreside firemain and installing a hydrant were well worth the benefits gained (both in terms of safety and public perception).*

In the spaces provided on the PVA Risk Assessment Worksheet, fill in the cost estimate for each countermeasure.

step
10

COST-BENEFIT (VALUE) ANALYSIS: ***Which potential solutions should be considered?***

Finally, putting everything together, combine the results from the above two steps – the estimate of effectiveness from step #8 and the cost estimate from step #9. This will give you an idea of which countermeasure gives you the "most bang for the buck." To do this, simply divide the estimate of effectiveness (step #8) by the cost estimate (step #9).

The following table will give you an idea of how this works.

Estimate of effectiveness (step #9)	÷	Cost Estimate (step #8)	=	Overall Score
1	÷	1	=	1
1	÷	3	=	0.33
2	÷	3	=	0.66
3	÷	1	=	3

In order to get the most out of your safety investment, chose the measures with the highest overall score. These are the ones that reduce the most risk for the least money. Do as many of these as your company sees fit. Also, recognize that some countermeasures may improve risk in more than one area. If that is the case, you may want to consider those first.

CASE STUDY: ***North Ferry Company has used the results of their trial run of this guide to further improve their safety record.*** *It heightened safety awareness among its employees to make them more vigilant in detecting causes of fires. This was achieved by performing smarter pre-boarding vehicle inspections and strictly enforcing the no smoking and engines off policies once the vehicles are aboard. North Ferry installed a public address system to use for reminding passengers of those policies. The P.A. system has the added benefit of use in emergency situations. Additionally, they installed a fire hydrant and hose rack at the Shelter Island terminal.*

In the spaces provided on the PVA Risk Assessment Worksheet, fill in the overall score by dividing the estimate of effectiveness (step #8) by the cost estimate (step #9). Write down those options with the highest scores in the spaces provided.

This concludes the assessment. The countermeasure with the highest overall score shows your best place for implementing risk reduction measures at the least cost. If you haven't

already done so, it is now up to you to communicate your results to those in a position to make the recommended changes. Even though this process may have taken a good deal of effort and time, it will become easier in future assessments because you will be more familiar with the process. You are encouraged to use this risk guide in the future for continued assessment of your operations as the need arises or time allows.

CONCLUSION: *Feedback Wanted*

We hope this guide has been useful in helping you assess your organization's operation for safety. If you've found areas where you can improve your operations, then this guide has been a success. For the benefit of other PVA members and future revisions of this guide, please provide your feedback regarding this guide or share your success stories regarding how your assessment turned out. Contact us at:

U.S. Coast Guard:

Human Element and Ship Design Division
Commandant (G-MSE-1)
U.S. Coast Guard Headquarters
2100 Second Street,S.W.
Washington, D.C. 20593
(202) 267-2997
fldr-he@comdt.uscg.mil
http://www.uscg.mil/hq/g-m/nmc/ptp/index.htm

Passenger Vessel Association:

Passenger Vessel Association
PVA Headquarters
1600 Wilson Blvd., Suite 1000A
Arlington, VA 22209
Phone: (800) 807-8360
(703) 807-0100
Fax: (703) 807-0103
pva@vesselalliance.com
http://www.passengervessel.com

PVA RISK ASSESSMENT WORKSHEET

STEP #1: Company Name ____
Vessel(s) Name ____
Phase of Operation Assessed ___________________________________

STEP #2: Participant Name Function/Title/Organization

Participant Name	Function/Title/Organization

STEP #3: Hazard Description	STEP #4: Frequency Rating		STEP #5: Impact Rating		STEP #6: Relative Risk Score
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	
		+		=	

(Highest three scores from reverse) Focus Hazards	STEP #7: Countermeasures	STEP #8: Estimate of Cost Effectiveness		STEP #9: Overall Estimates		STEP #10: Score
A.	1.		÷		=	
	2.		÷		=	
	3.		÷		=	
	4.		÷		=	

PVA RISK ASSESSMENT WORKSHEET

(Optional)	5. _____	_____	÷	_____	=	_____
B. _____	1. _____	_____	÷	_____	=	_____
	2. _____	_____	÷	_____	=	_____
	3. _____	_____	÷	_____	=	_____
	4. _____	_____	÷	_____	=	_____
(Optional)	5. _____	_____	÷	_____	=	_____
C. _____	1. _____	_____	÷	_____	=	_____
	2. _____	_____	÷	_____	=	_____
	3. _____	_____	÷	_____	=	_____
	4. _____	_____	÷	_____	=	_____
	5. _____	_____	÷	_____	=	_____

STEP #10 (CONTINUED): Choose those countermeasures with the highest Overall Score.

_____
_____
_____
_____

CASE STUDY: Spirit Cruises

1. BOUND THE PROBLEM (STEP #1)

Where (which geographic areas to examine)

~~One geographic area (Washington DC)~~

✓ Generic geographic area

Note: Group decided to use "generic" operating area because many ports were represented

When (which operations to consider)

✓ When crew boards until they leave (staffed)

~~When passengers embark until they leave (boarded)~~

~~When boat leaves pier until it returns (underway)~~

~~When boat is underway (cruise)~~

Note: Group decided to examine operations from when first staff person arrived until last staff person left, providing maximum scope

What (safety and other concerns to be addressed)

✓ Passengers/crews

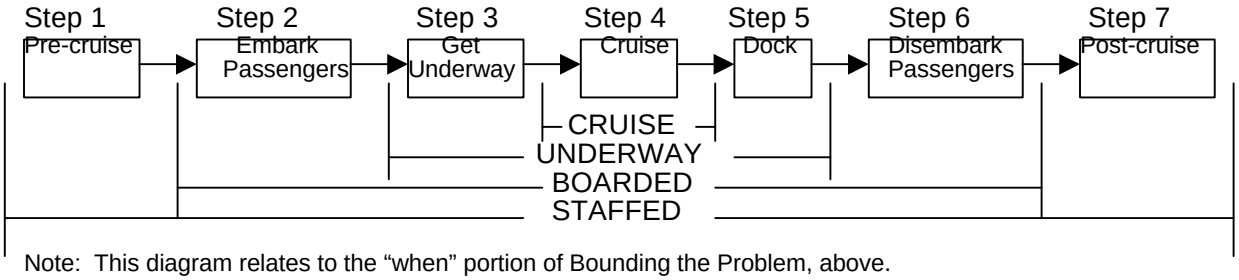
✓ Vessel/physical plant

✓ Environment

~~Financial~~

Note: Group decided to not consider financial risks for this workshop, but could do so in future

2. ESTABLISH OPERATING SCENARIO (STEP #1)



Note: This diagram relates to the "when" portion of Bounding the Problem, above.

3. GATHER EXPERTS (STEP #2)

Spirit Marine gathered eight of its Captains from five ports and invited both the local Coast Guard marine inspector and members from the Coast Guard Headquarters. The completed worksheet at the end of this Appendix contains a list of people who attended.

CASE STUDY: Spirit Cruises

4. IDENTIFY OPERATIONS CONDUCTED IN EACH STEP OF SCENARIO (STEP #3)

1. Pre-Cruise:
   - -Shore hookups
   - -Wash down
   - -Clean up/set up
   - -Loading stores
   - -Food preparation/cooking
   - -Start generator
   - -Maintenance/regular inspections
   - -Periodic maintenance
   - -Lines handling/gangway
   - -Meetings
   - - Fueling

2. Embark Passengers:
   - -Board passengers up gangway
   - -Collecting tickets/ greet/direct passengers
   - -Seating passengers
   - -Provisioning
   - -Taking pictures
   - -Food/drink service
   - -Attending to handicapped passengers
   - -Start engines
   - -Gangway
   - - Shore hookups
   - - "Straggler ops"

3. Get Underway:
   - -Line handling
   - -Gangway
   - -Shore hook ups
   - -Stow dock lines
   - -Secure gates
   - -Reporting to deck stations
   - -Retrieve dock runner
   - -Stern watch
   - -Communications
   - -Maneuver to channel
   - -Observe conditions

4. Cruise:
   - -Passengers eating/socializing
   - - Passengers moving around boat
   - -Navigating
   - -Performers performing
   - -Crew roving decks
   - -Food/drink service
   - -Communicating
   - -Documentation
   - -Engine checks

5. Dock:
   - -Check engine reverse
   - -Line handling
   - -Plan approach
   - -Maneuver alongside
   - -Main engine shutdown
   - -Dock runner ashore
   - -Shore hook
   - -Gangways and gates
   - -Passenger control

6. Disembark Passengers:
   - -Passengers down gangway
   - -Selling pictures
   - -Pump sewage
   - -Passenger control on docks
   - -Attending to handicapped passengers
   - -Trash removal
   - -Water fill

7. Post-Cruise:
   - -Trash removal
   - -Pump sewage
   - -General clean up
   - -Shore connections
   - -Line handling
   - -Maintenance/inspection
   - -Reprovisioning
   - -Secure vessel (set alarms)
   - -Water fill
   - -Wash down
   - -Switch power
   - -Debark staff
   - -Meeting
   - -Secure gangway
   - -Documentation

5. CONDUCT RISK ASSESSMENT (HAZARD IDENTIFICATION FOR EACH STEP IN SCENARIO) (STEP #3)

(Note: In later steps of the hazard identification process, those hazards already identified in previous steps are not always repeated)

1. Pre-Cruise Hazards

-Boarding without gangway — fall in water
-Fuel spill during fueling
-Sewage spill
-Dock fire
-Slips, falls, back injury during stores provisioning
-Severe cuts, burns during food preparation
-Catastrophe—mechanical failure (e.g. engine)
-Fall in water (un) observed
-Fire during fueling
-Electric shock during shore hook-up
-Vessel fire (e.g.. linen)
-Other slips, falls, burns (start ups)
-Injury during black-out
-Catastrophe —flooding

2. Embark Passengers Hazards

-Overloaded gangway/collapse
-Stray passenger injuries
-Lifting injuries while loading wheelchairs
-Injuries to unattended children
-Exposure to elements
-Straggler injuries
-Other slips, trips, falls
-Gangway disconnect excessive motion
-Slips, trips, falls at gangway ends
-Run-away wheelchairs
-Fall through railings
-Passengers altercations
- Objects in food/spilled hot beverages

3. Get Underway Hazards

-Caught up in lines
-Collision with another vessel
-Fall in water (work over water) / man overboard
-Allisions
- major
- minor
-Loss of control
-Propeller damage (lines, floating objects)
-Grounding depending on location
-Ice, wind, restricted visibility, sea state

4. Cruise Hazards

-Injuries due to machinery
-Situational management
- loss of awareness
- distraction
- multiple events
-High speed collision, allision, grounding
- major
- minor
-Fire underway
-Mechanical failure u/w
propulsion
electrical
steering
navigation equipment
- Man overboard
-Flooding underway
-Medical evacuation and/or emergency

5. Dock Hazards

-Squish Injury
-Complacency
-Contact with unknown/hidden objects (over- or unfamiliarity)
-Loss of control
-Hard landing/docking

6. Disembark Passengers Hazards

-Trips and falls
-Sewage spills
-Trash spills
-Two-way traffic
-Sliding down ramp

7. Post-Cruise Hazards

--Fall into open hatch

Other Hazards from PVA Risk Guide

-Violence and robbery
-Terrorism
-Exceptional boardings

CASE STUDY: Spirit Cruises

6. CONSOLIDATE HAZARD LIST (STEP #3)

✓ Keep
-- ~~Delete~~
O Included in other hazards

***NOTE**: Originally in step #1, the group decided to look at a broad view of their operation (the whole mountain range). When they reached step #3 though, they decided to narrow the hazard list (identify the peaks). This was done in two steps - first by consolidating like hazards, then by identifying a smaller set for immediate consideration.*

✓Gangway injuries-collapse, excessive motion, disconnect
✓Fall into water (working over water)
-~~Fuel spill~~
-~~Fueling fire~~
-~~Sewage spill~~
✓Electric shock
❍ Dock fire
-~~Back injuries during lifting (stores, wheel chairs)~~
-~~Slips, trips, falls, before, during and after cruise~~
-~~Flooding at dock~~
-~~Stray / unescorted passenger injuries~~
-~~Passenger altercations~~
-~~Injuries to stragglers~~
❍ Line handling injuries
- ~~Propeller damage~~
✓Grounding
❍ Ice, wind, restricted vision, sea state
❍ Fire underway
-~~Loss of electricity~~
❍ High speed collision/allision/grounding
❍Squish injury
-~~Complacency~~
-~~Hard landing~~
-~~Trash spill~~
❍Two-way traffic
-~~Fall into open hatch~~
✓Violence/robbery
❍Exceptional robbery
-~~Terrorism~~
✓Vessel fire
-~~Burns, cuts from food prep~~
✓Exposure to elements
❍ Engine failure
-~~Injuries to unattended children~~
-~~Objects in food/spilled hot beverages~~
❍ Man overboard
✓Collisions
✓Loss of control
-~~Blackout injuries~~
-~~Rotating machinery injuries~~
❍ Loss of steering
✓Flooding underway
✓Medical emergency & evacuation
-~~Contact due to unfamiliarity~~

7. FOCUS ON CRITICAL HAZARDS

"DIRTY" DOZEN (Baker's Dozen) – HAZARD LIST (STEP #3)

1. Fall into water – Shipmate falling overboard while dockside
2. Vessel fire
3. Flooding - water entering the watertight envelope or from internal spills from tanks/pipes
4. Collisions
5. Allisions – not including hard landings
6. Grounding
7. Exposure to elements – all conditions, focus on summertime
8. Docking injuries (crew) -- line handling / fall in water / squish
9. Electrical shock
10. Passenger embarkation / debarkation injury
11. Loss of mechanical control (other than those resulting in collision/allision/grounding
12. Medical emergency/evacuation
13. Violence / robbery / crime

8. ESTABLISH ING SCALES FOR HAZARD FREQUENCY AND CONSEQUENCE (STEPS #4 & 5)

Frequency

1. Once in a lifetime (Note: Frequency of hazard occurring across entire Sprit fleet)
2. Every 5 years
3. Yearly
4. Monthly
5. Weekly

Consequence

	Personnel/passenger	Boat / facility
1.	First aid	Cosmetic damage
2.	Paramedic / E.R. visit	Damage resulting in loss of 1 day
3.	Multiple E.R. visit or hospitalization	Damage resulting in loss of 1 week to1 month
4.	Multiple hospitalizations or single death	Damage resulting in loss of 1 season
5.	Multiple deaths	Loss of vessel

9. CONDUCT RISK ANALYSIS (ESTABLISH FREQUENCIES AND CONSEQUENCES FOR CRITICAL HAZARD (STEPS #4 & 5)

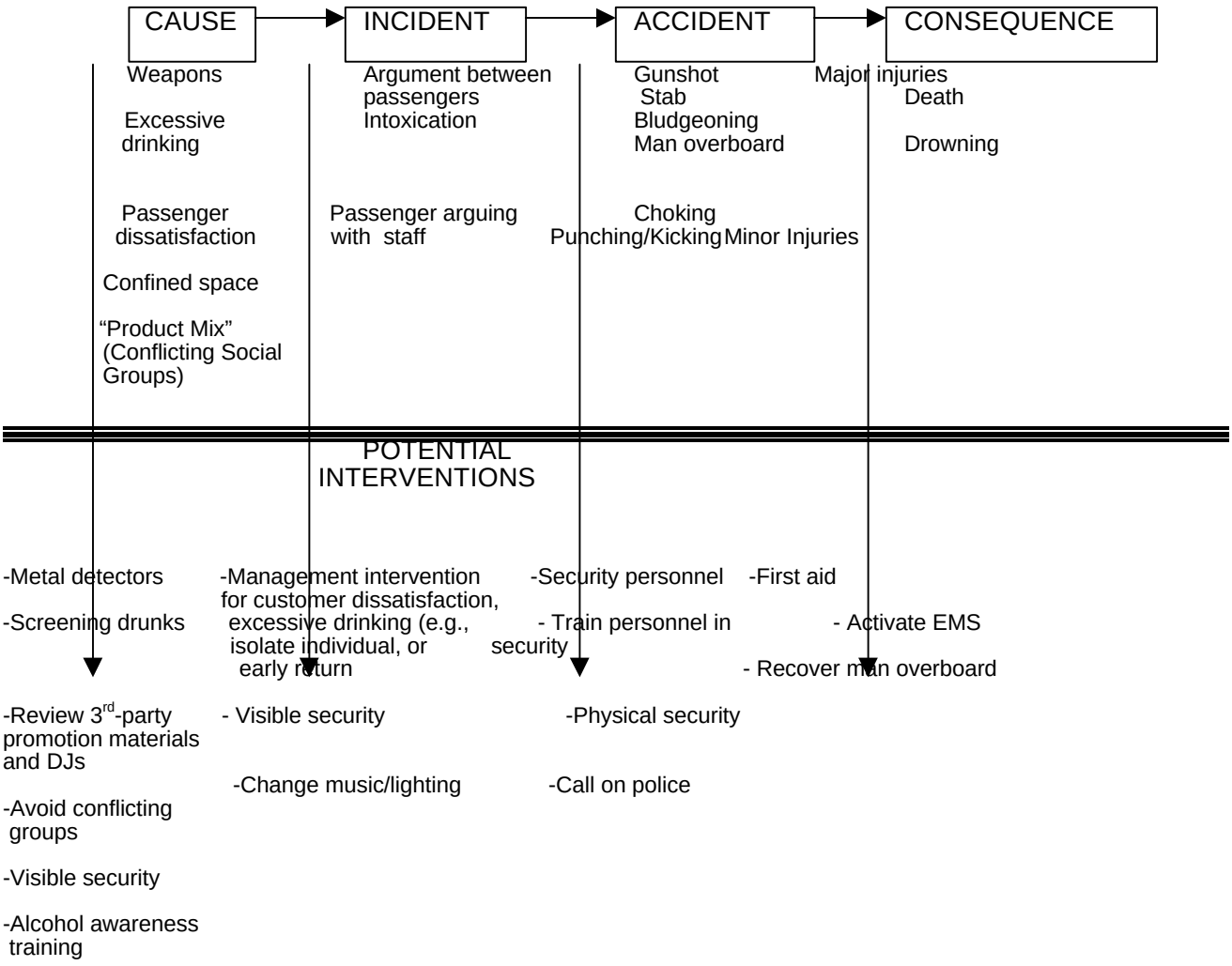
RISK ANALYSIS LIST

HAZARD	FREQUENCY	CONSEQUENCE
Fall in water	3	2
Vessel fire	3	1
Flooding	4	1
Collision	1	4
Allision	3	3
Grounding	2	2
Exposure	5 (per season basis)	1
Docking injuries	2	3
Electrical shock	1	2
Passenger injury embarkation / debarkation	3	1
Loss of control	2	2
Medical emergency / evacuation	5 (per season basis)	3
Violence / robbery / crime	5 (per season basis)	1

10. CONDUCT RISK MANAGEMENT (DEVELOP CAUSAL CHAIN & INTERVENTIONS) (STEP #7)

Identified Hazard: Violence Between Passengers

CAUSAL CHAIN



CASE STUDY: Spirit Cruises

STEP #1: Company Name Spirit Cruises

Vessel(s) Name various generic assessment

Phase of Operation Assessed any time there is a person aboard

STEP #2: Participant Name	Function/Title/Organization
	Capt. Spirit NY/NJ
	Capt. Spirit of Norfolk
	Capt. Spirit of Philadelphia
	Capt. Spirit of Washington
	Capt. Spirit of Boston
	President of Spirit Marine
	Coast Guard marine inspector
	Coast Guard HQ

* frequency estimated on a "per season"basis

STEP #3: Event Description	STEP #4: Frequency Rating		STEP #5: Effect Rating		STEP #6: Relative Risk Score
Shipmate falls into water while alongside	3	+	3	=	6
Vessel fire	3	+	3	=	6
Flooding water entering watertight envelope or internal spills	4	+	3	=	7
Collisions	1	+	3	=	4
Allisions including hard landings	3	+	3	=	6
Grounding	2	+	3	=	5
Passenger exposure to elements all conditions, but focus on summertime	5*	+	3	=	8
Docking injuries (crew) line handling / fall in water / squish	2	+	3	=	5
Electrical shock	1	+	3	=	4
Passenger embarkation /debarkation injury	3	+	3	=	6
Loss of mechanical control	2	+	3	=	5
Medical emergency / evacuation	5*	+	3	=	8
Violence / robbery / crime	5*	+	3	=	8

CASE STUDY: Spirit Cruises

(Highest three scores from reverse) Focus Hazards		STEP #7: Counter Measures	STEP #8: Estimate of Cost Effectiveness		STEP #9: Overall Estimate		STEP #10 Score
A. **Violence between passengers**	1.	**Metal detectors**	____	÷	____	=	____
	2.	**Screening drunks**	____	÷	____	=	____
	3.	**Review 3rd party promo material**	____	÷	____	=	____
	4.	**Avoid conflicting groups**	____	÷	____	=	____
(Optional)	5.	**Visible security**	____	÷	**Steps #8, 9, & 10**		
B. 6	~~1.~~	**Alcohol awareness training**	____	÷	**not completed during**		
7	~~2.~~	**Management intervention**	____	÷	**this workshop.**		
8	~~3.~~	**Change music & lighting**	____	÷	____	=	____
9	~~4.~~	**Train personnel in security**	____	÷	____	=	____
(Optional) 10	~~5.~~	**Call on police**	____	÷	____	=	____
C. 11	~~1.~~	**First aid**	____	÷	____	=	____
12	~~2.~~	**EMS activation**	____	÷	____	=	____
13	~~3.~~	**Man overboard recovery**	____	÷	____	=	____
	4.		____	÷	____	=	____
	5.		____	÷	____	=	____

STEP #10 (CONTINUED): Choose those options with the highest Overall Score

_____
_____
_____
_____